

# Analisis Process Mining pada Proses Penanganan Pasien Sepsis Menggunakan Event Log Publik

# DATASET & TAHAPAN ANALISIS

[link dataset](#)

xes.version	xes.features	openxes.version	name	prefix	uri	scope	key	value	key2	value2	name2	keys	key3	value3	key4	value4	key5	value5	key6	value6
1	nested-attributes	1.0RC7	Organizational	org	<a href="http://www.xes-standard.org/org.xesext">http://www.xes-standard.org/org.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_Organization	meta_org	<a href="http://www.xes-standard.org/meta_org.xesext">http://www.xes-standard.org/meta_org.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_Time	meta_time	<a href="http://www.xes-standard.org/meta_time.xesext">http://www.xes-standard.org/meta_time.xesext</a>															
1	nested-attributes	1.0RC7	Time	time	<a href="http://www.xes-standard.org/time.xesext">http://www.xes-standard.org/time.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_3TU	meta_3TU	<a href="http://www.xes-standard.org/meta_3TU.xesext">http://www.xes-standard.org/meta_3TU.xesext</a>															
1	nested-attributes	1.0RC7	Lifecycle	lifecycle	<a href="http://www.xes-standard.org/lifecycle.xesext">http://www.xes-standard.org/lifecycle.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_LifeCycle	meta_life	<a href="http://www.xes-standard.org/meta_life.xesext">http://www.xes-standard.org/meta_life.xesext</a>															
1	nested-attributes	1.0RC7	Concept	concept	<a href="http://www.xes-standard.org/concept.xesext">http://www.xes-standard.org/concept.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_Concept	meta_concept	<a href="http://www.xes-standard.org/meta_concept.xesext">http://www.xes-standard.org/meta_concept.xesext</a>															
1	nested-attributes	1.0RC7	MetaData_General	meta_general	<a href="http://www.xes-standard.org/meta_general.xesext">http://www.xes-standard.org/meta_general.xesext</a>															
1	nested-attributes	1.0RC7				trace	concept.name	DEFAULT												
1	nested-attributes	1.0RC7				event	lifecycle:transition	DEFAULT	time:timestamp	1970-01-01T01:00:00.000+01:00										
1	nested-attributes	1.0RC7				event	concept.name	DEFAULT	time:timestamp	1970-01-01T01:00:00.000+01:00										
1	nested-attributes	1.0RC7				event	org:group	DEFAULT	time:timestamp	1970-01-01T01:00:00.000+01:00										
1	nested-attributes	1.0RC7					concept.name	concept.name												
1	nested-attributes	1.0RC7					org:group	org:group												
1	nested-attributes	1.0RC7											meta_org:different_resources_standard_deviation		0			meta_org:different_resources_min		1
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 CRP
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Release B
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Release A
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Release D
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Release C
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Release E
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Admission IC
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Return ER
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 ER Triage
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 IV Antibiotics
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Leucocytes
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 ER Registration
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 IV Liquid
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 Admission NC
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 LacticAcid
1	nested-attributes	1.0RC7																meta_concept:named_events_total		15214 ER Sepsis Triage
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 A		3.297			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 B		7.725			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 C		1.003			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 D		0.045			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 E		0.745			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 F		0.206			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 G		0.141			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 H		0.052			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 I		0.12			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 J		0.025			
1	nested-attributes	1.0RC7											meta_org:group_events_average		14.49 K		0.017			

# KODE/SCRIPTS EXPLORATORY ANALYSIS

[link github](#)

```
=====
# VISUALIZATION
=====
figure(figsize=(10, 5))
plt.bar(activities.keys(), activities.values())
plt.xticks(rotation=90)
plt.title("Frequency of Activities")
plt.tight_layout()
plt.savefig("results/activity_frequency.png")
plt.close()

figure(figsize=(8, 5))
plt.hist(case_durations, bins=30)
plt.title("Distribution of Case Duration")
plt.xlabel("Duration (seconds)")
plt.ylabel("Number of Cases")
plt.tight_layout()
plt.savefig("results/case_duration_distribution.png")
plt.close()

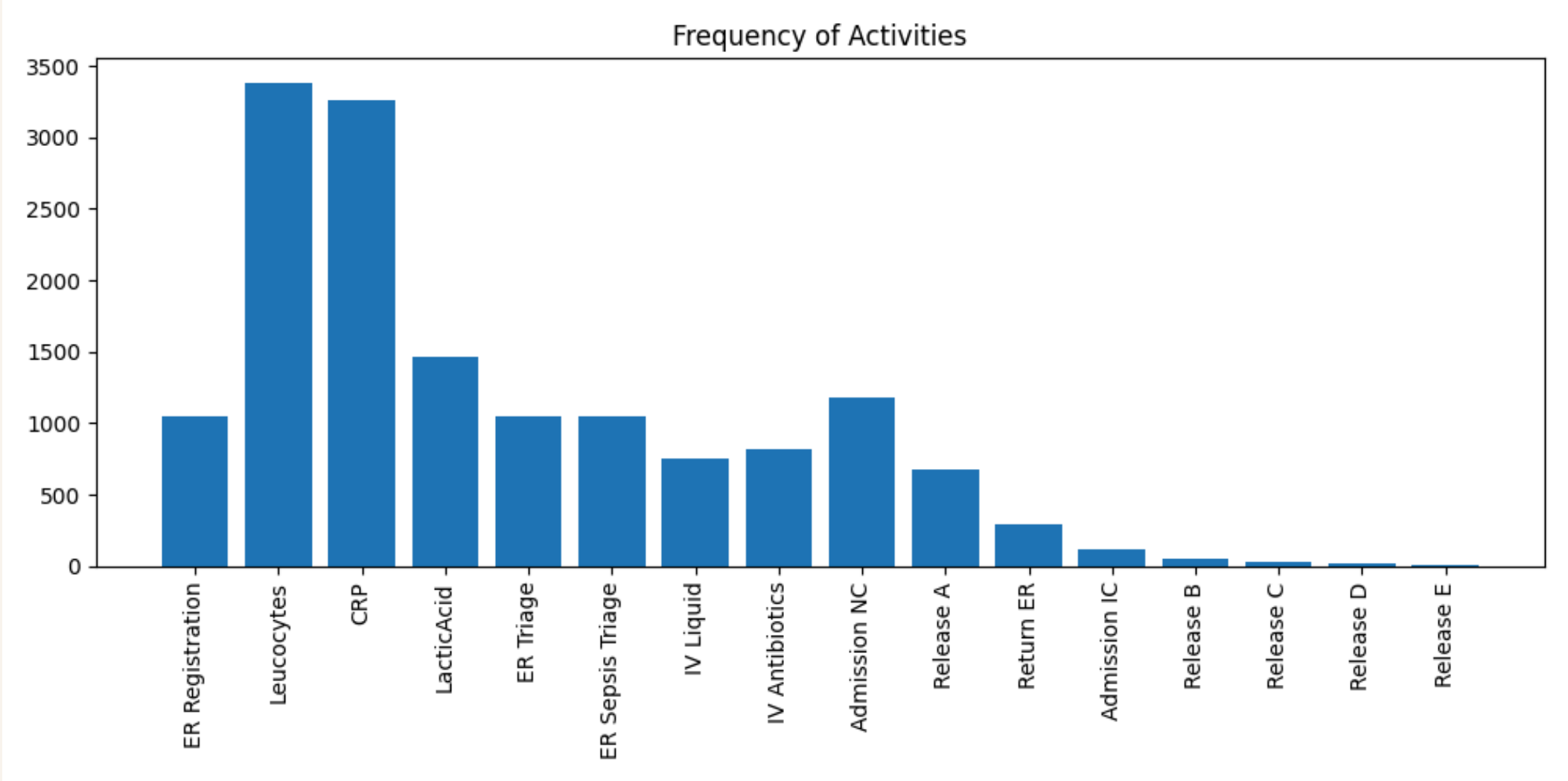
print("\nGrafik berhasil disimpan di folder results")

30 avg_duration = sum(case_durations) / len(case_durations)
31 print("Rata-rata durasi proses (detik):", round(avg_duration, 2))
32
33 # =====
34 # MOST FREQUENT ACTIVITIES
35 # =====
36 sorted_activities = sorted(activities.items(), key=lambda x: x[1], reverse=True)
37
38 print("\nAktivitas paling sering:")
39 for act, freq in sorted_activities[:5]:
40     print(f"{act}: {freq}")
41
42 # =====
43 # START & END ACTIVITIES (FIXED)
44 # =====
45 start_act = start_activities.get_start_activities(log)
46 end_act = end_activities.get_end_activities(log)
47
48 print("\nAktivitas awal dominan:")
49 print(start_act)
50
51 print("\nAktivitas akhir dominan:")
52 print(end_act)
53
```

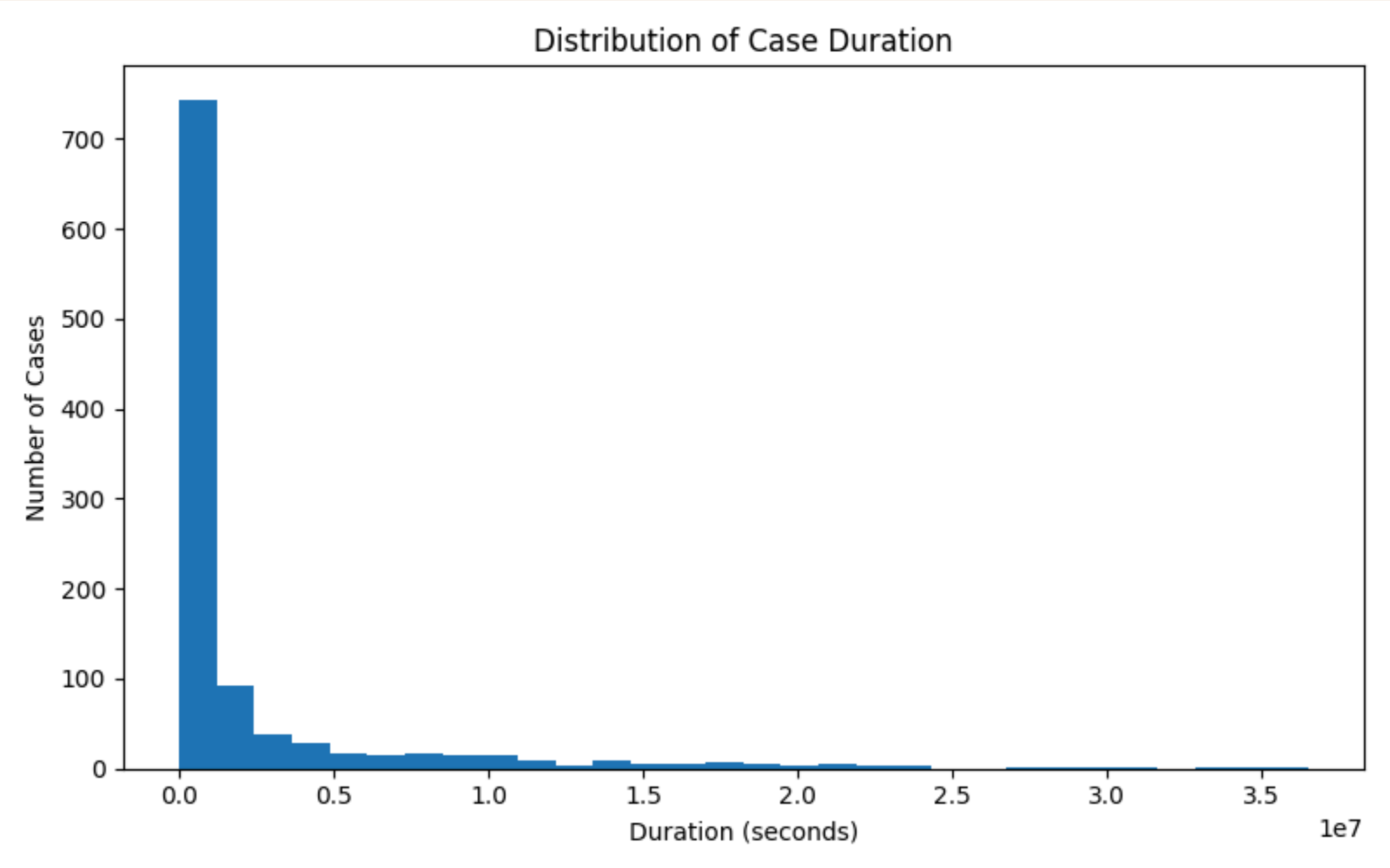
# GRAFIK EXPLORATORY ANALYSIS



Frequency of Activities



Distribution of Case Duration



# KODE/SCRIPTS PROCESS DISCOVERY

[link](#) [github](#)

```
1 from pm4py.objects.log.importer.xes import importer as xes_importer
2 from pm4py.algo.discovery.inductive import algorithm as inductive_miner
3 from pm4py.objects.conversion.process_tree import converter as pt_converter
4 from pm4py.visualization.petri_net import visualizer as pn_visualizer
```

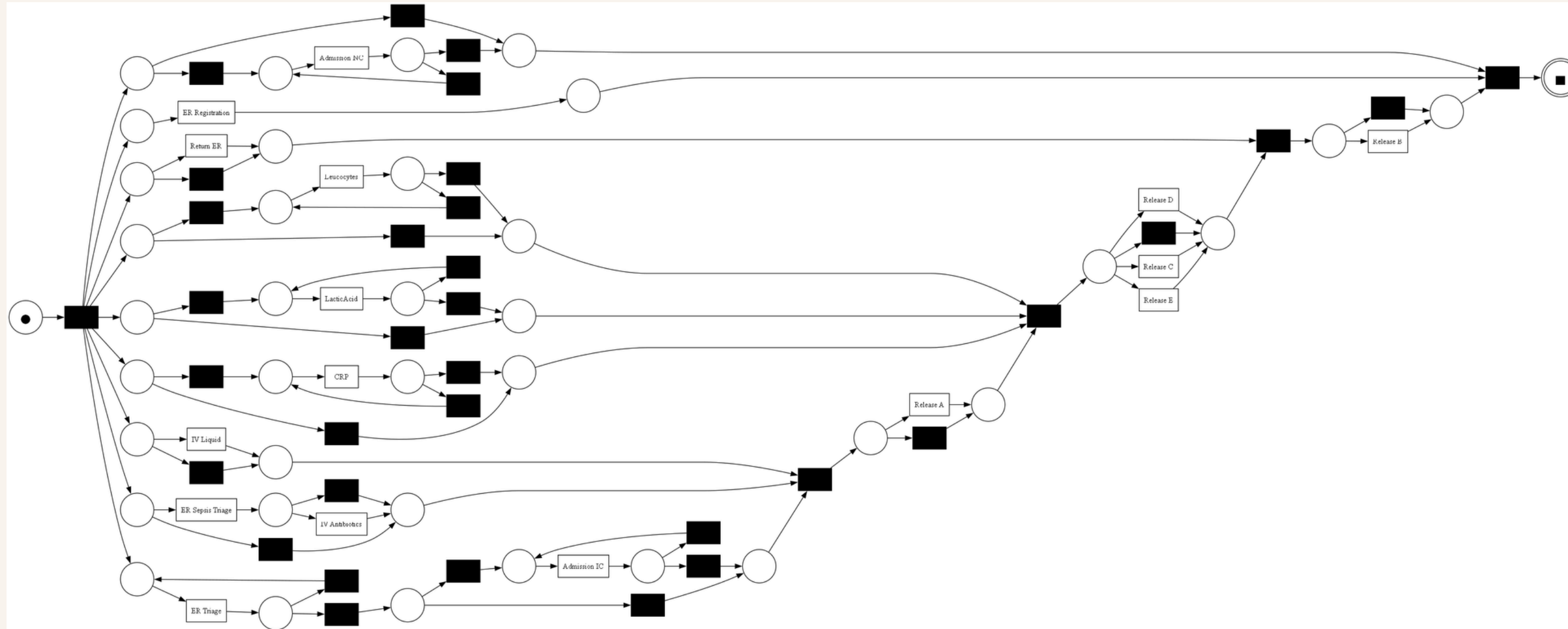
```
5
6 # =====
7 # LOAD EVENT LOG
8 # =====
9 log = xes_importer.apply("data/sepsis_cases.xes")
10 print("Event log berhasil dimuat")
```

```
11
12 # =====
13 # PROCESS DISCOVERY
14 # =====
15 print("Menjalankan Inductive Miner...")
16 process_tree = inductive_miner.apply(log)
17 print("Process Tree berhasil dibuat")
18
```

```
18
19 # =====
20 # CONVERT TO PETRI NET
21 # =====
22 net, initial_marking, final_marking = pt_converter.apply(process_tree)
23 print("Petri Net berhasil dikonversi")
24
25 # =====
26 # VISUALIZATION
27 # =====
28 gviz = pn_visualizer.apply(net, initial_marking, final_marking)
29 pn_visualizer.save(gviz, "results/process_model.png")
30
31 print("Model proses berhasil disimpan di folder results/")
32
```

# PROCESS DISCOVERY

[link](#) [github](#)



# KODE/SCRIPTS CONFORMANCE CHECKING

[link github](#)

```
1  from pm4py.objects.log.importer.xes import importer as xes_importer
2  from pm4py.algo.discovery.inductive import algorithm as inductive_miner
3  from pm4py.objects.conversion.process_tree import converter as pt_converter
4  from pm4py.algo.conformance.alignments.petri_net import algorithm as alignments
5
6  # =====
7  # LOAD EVENT LOG
8  # =====
9  log = xes_importer.apply("data/sepsis_cases.xes")
10 print("Event log berhasil dimuat")
11
12 # =====
13 # PROCESS DISCOVERY
14 # =====
15 process_tree = inductive_miner.apply(log)
16 net, initial_marking, final_marking = pt_converter.apply(process_tree)
17 print("Model Petri Net siap untuk conformance checking")
18
```

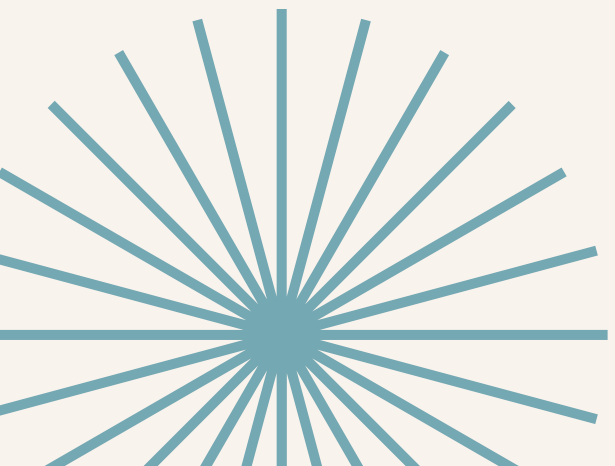
```
18
19 # =====
20 # CONFORMANCE CHECKING (ALIGNMENT)
21 # =====
22 print("Menjalankan conformance checking (alignment)...")
23
24 aligned_traces = alignments.apply_log(
25     log,
26     net,
27     initial_marking,
28     final_marking
29 )
30
31 # =====
32 # FITNESS CALCULATION
33 # =====
34 fitness_values = [
35     align["fitness"] for align in aligned_traces if "fitness" in align
36 ]
37
38 average_fitness = sum(fitness_values) / len(fitness_values)
39
40 print("Jumlah trace:", len(aligned_traces))
41 print("Rata-rata fitness:", round(average_fitness, 4))
42
```

# CONFORMANCE CHECKING

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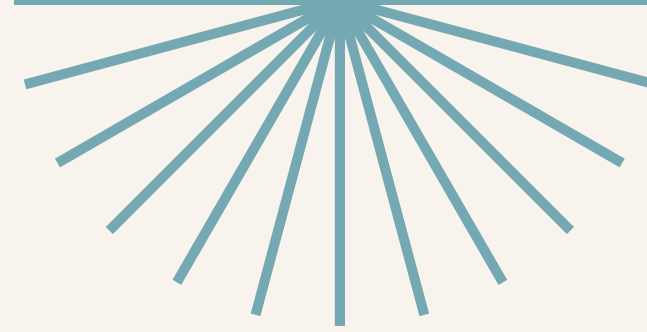
[link github](#)

```
C:\Users\asus\Documents\Semester 5\data mining\20123044_C1.23_UASProsesMining-main>python scripts\step3_conformance_checking.py
parsing log, completed traces :: 100%|████████████████████████████████████████| 1050/1050 [00:00<00:00, 2235.83it/s]
Event log berhasil dimuat
Model Petri Net siap untuk conformance checking
Menjalankan conformance checking (alignment)...
aligning log, completed variants :: 100%|████████████████████████████████████████| 846/846 [12:28<00:00, 1.13it/s]
Jumlah trace: 1050
Rata-rata fitness: 1.0
```



# PRECISION, GENERALIZATION, SIMPLICITY

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[link github](#)

Precision  
Model tidak  
memperbolehkan perilaku  
yang tidak terdapat pada  
event log.

Generalization  
Model mampu  
menangkap variasi  
proses yang wajar dari  
data.

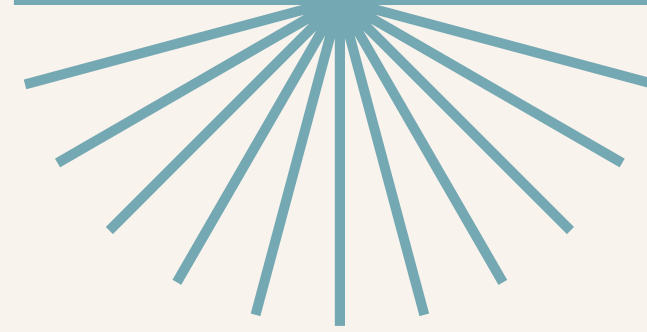
Simplicity  
Model memiliki struktur  
yang cukup sederhana  
sehingga mudah dipahami.

# BOTTLENECK ANALYSIS



[link github](#)

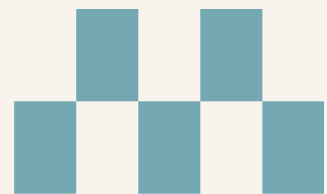
	A	B	C
1	Aktivitas	Durasi (detik)	
2	Release E	9742100	
3	Release A	7063078.95323741	
4	Release C	5886817	
5	Release D	4803766	
6	Admission NC	123779.52054794521	
7	CRP	60556.64296802235	
8	Leucocytes	46083.96166516921	
9	Admission IC	18362.34188034188	
10	LacticAcid	14426.128294036062	
11	IV Antibiotics	5899.372282608696	
12	IV Liquid	4059.310391363023	
13	ER Sepsis Triage	1193.272	
14	Return ER	1117.3333333333333	
15	Release B	810	
16	ER Registration	643.9571428571429	
17	ER Triage	405.2369172216936	



[link github](#)

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# REKOMENDASI PERBAIKAN PROSES



# PENUTUP

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